P4-RT-Exam.-Oct.-12-201

Con. 9250-12.

KR-3089

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
    (2) Attempt any **four** questions from the remaining **six** questions.
    (3) **Figures** to the **right** indicate **full marks**.

1. (a) State Dirichlet condition for the expansion of f(x) as Fourier series. Examine wether   5
$f(x) = \sin\left(\frac{1}{x}\right)$ can be expanded in Fourier series in $[-\pi, \pi]$.

(b) Find $L^{-1}\left[\dfrac{1}{\sqrt{5}\cdot(s-1)}\right]$ 5

(c) Find $Z\{f(k)\}$ where –   5

$$f(k) = \begin{cases} -\left(-\frac{1}{4}\right)^k & k < 0 \\ \left(-\frac{1}{5}\right)^k & k \geq 0 \end{cases}$$

(d) Express the function   5

$$f(x) = \begin{cases} 1, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$$

as a Fourier integral hence evaluate

$$\int_0^\infty \frac{\sin\lambda \, \cos\lambda x}{\lambda} \, d\lambda$$

2. (a) Define linear dependence and independence of vectors. If the vectors $(0,1,a)$, $(1,a,1)$ 6
and $(a,1,0)$ are Linearly dependent then find the value of a.

(b) Find $L^{-1}\left[\dfrac{s}{\left(s^2+1\right)\left(s^2+4\right)\left(s^2+9\right)}\right]$.   6

(c) Find $\{f(k)\}$ if $F(z) = \dfrac{1}{(z-3)(z-2)}$ if ROC of F(z) is –   8

    (i) $|z| < 2$ (ii) $z < |z| < 3$ (iii) $|z| > 3$.

[TURN OVER

Con. 9250–KR–3089–12.

2

3. (a) Determine the value of a and b for which the system –

$$x + 2y + 3z = 6$$
$$x + 3y + 5z = 9$$
$$2x + 5y + az = b$$

has (i) no solution (ii) unique solution (iii) infinite number of solution. Find the solution in case (ii) and (iii).

(b) Evaluate $\int_0^\infty e^{-2t} t^3 \cos t \, dt$.

6

(c) Find Fourier series for f(x) in (0, 2π) –

$$f(x) = \begin{cases} x & , \quad 0 < x \le \pi \\ 2\pi - x & , \quad \pi \le x < 2\pi \end{cases}$$

8

Hence deduce that $\dfrac{\pi^4}{96} = \dfrac{1}{1^4} + \dfrac{1}{3^4} + \dfrac{1}{5^4}$.

4. (a) Find two nonsingular matrices P and Q such that PAQ is in the normal form where– 6

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 3 & 2 \\ 2 & 1 & 3 \end{bmatrix}$$

(b) Find $L(|\cos t|)$

(c) (i) If A, B are Hermitian prove that AB – BA skew Hermitian. 6

8

(ii) If $A = \begin{bmatrix} 2 & 3+2i & -4 \\ 3-2i & 5 & 6i \\ -4 & -6i & 3 \end{bmatrix}$ show that A is

Hermitian and iA is skew Hermitian.

5. (a) Solve y" + 2y = r(t) ; y(0) = 0 , y'(0) = 0 using Laplace Transform where 6

$$r(t) = \begin{cases} 1 & , \quad 0 \le t \le 1 \\ 0 & , \quad t > 1 \end{cases}$$

(b) Find the complex form of the Fourier series of the function
$$f(x) = x^2 + x, \quad -\pi < x < \pi.$$

6

(c) Find z (aⁿ), z (cos nθ), z (sin nθ).

8

6. (a) Show that $e^x = 2\pi \left[\dfrac{1+e}{1+\pi^2} \sin\pi x + \dfrac{2(1-e)}{1+4\pi^2} \sin 2\pi x + \dfrac{3(1+e)}{1+9\pi^2} \sin(3\pi x) + ... \right]$. **6**

(b) Find the inverse Laplace Transform of – **6**

$$\dfrac{s^3 - 7s^2 + 14s - 9}{(s-1)^2 (s-2)^3}$$

(c) Obtain Fourier series for the function – **8**

$$f(x) = \begin{cases} x, & -\pi < x < 0 \\ -x, & 0 < x < \pi \end{cases}$$

hence show that $\dfrac{\pi^2}{8} = \dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + ...$

7. (a) Find the Fourier Transform of – **6**

$$f(x) = \begin{cases} 1-x^2, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$$

(b) Using Laplace Transform evaluate – **6**

$$\int_0^\infty e^{-t}\left(1 + 2t - t^2 + t^3\right) H(t-1)\,dt$$

(c) Show that the system of equations – **8**

ax + by + cz = 0
bx + cy + az = 0
cx + ay + bz = 0

has a non Trivial solution if a + b + c = 0 or if a = b = c. Find the non Trivial solution when the condition is satisfied.

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194-p3-d-upg-SH KL12 B

Con. 9604–12.

KR–3182

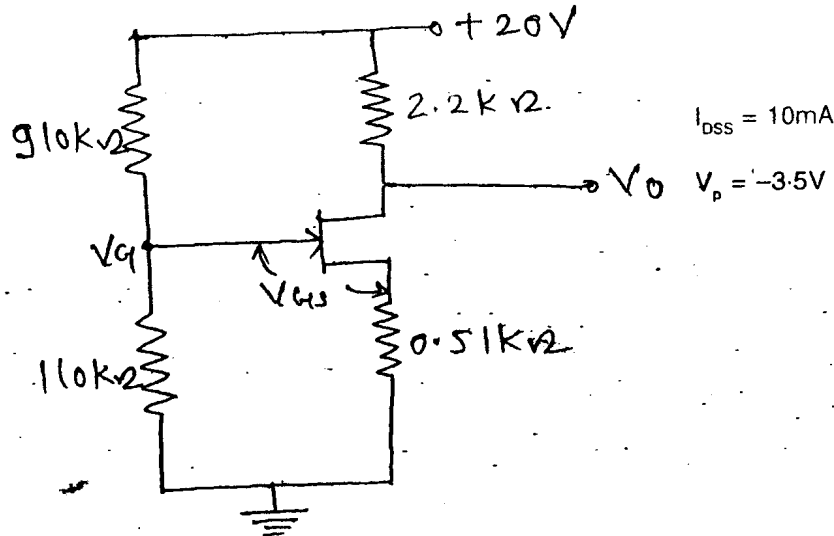(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.
   (2) Attempt any **four** questions out of remaining **six** questions
   (3) Figures to the **right** indicates **full** marks.
   (4) Assume **suitable** data wherever **necessary** and mention.

1. (a) Draw equivalent circuit diagram of Op-Amp and explain each term.   4
   (b) Compare BJT and FET.   4
   (c) Design practical differentiator for the frequency 5KHz.   4
   (d) Explain virtual short and virtual ground concept.   4
   (e) Using practical Op-Amp realize following relation : $V_0 = 2V_1 + 5V_2 + 7V_3 - V_4$. 4

2. (a) Explain the Graphical determination of the h parameters using characteristics curves 10
        of CE amplifier.
   (b) Determine V_C and V_B for the network shown in **figure No. 1**.   10
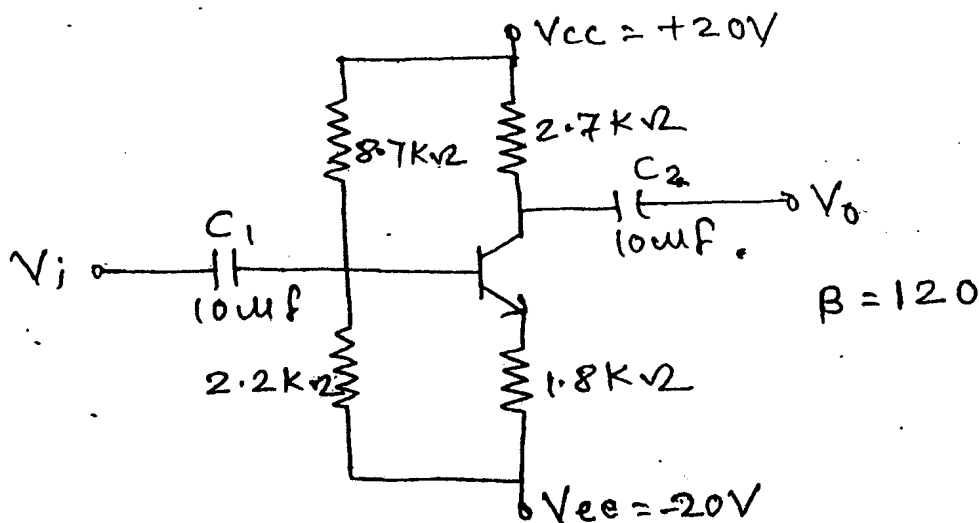
[**TURN OVER**

3. (a) Explain the terms CMRR, PSRR.   **5**

   (b) For the network shown in **Figure No. 2**, determine I_D, V_{GS}, V_G, V_D, V_S and V_{DS}.   **15**

$+20V$

$2.2 k \Omega$

$910k\Omega$

V_G

V_{GS}

$110k\Omega$

$0.51k\Omega$

V_0 $V_p = -3.5V$

$I_{DSS} = 10mA$

4. (a) Explain any two applications of astable multivibrator using IC 555.   **10**

   (b) Design a regulator using LM 723 for $V_0 = 9V$ and $I_0 = 3$ Amps.   **10**

5. (a) Draw and explain successive approximation resister type ADC.   **10**

   (b) Explain how an Op-Amp can be used as :—   **10**
       (i) Practical Integrator
       (ii) Schmitt trigger.

6. (a) Explain Instrumentation Amplifier using Transducer bridge circuit.   **10**

   (b) Explain how Op-Amp can be used as summing, scaling and averaging amplifier in   **10**
       Inverting configuration.

7. Write short notes on (any four) :—   **20**
   (a) Features of timer
   (b) PLL
   (c) Properties of Ideal Op-Amp
   (d) Zero crossing detector
   (e) Construction of n-channel JFET.

(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.

    (2) Attempt any **four** questions out of the remaining **six** questions.

    (3) **Assumptions** made should be clearly **stated**.

    (4) **Figures** to the **right** indicate marks for **each** question.

    (5) Assume **suitable** data whenever **required**.

1. (a) Compare Iteration and Recursion.   5

   (b) Explain different types of data structures with example.   5

   (c) Write a program in Java to impliment Binary search on sorted set of integers.   10

2. (a) Write a program to impliment "copy" command for copying bytes from one file to   10
another file using file I/o commands. Program should make use of command line
argument.

   (b) Write a program in Java to sort given n integer number using heap sort.   10

3. (a) Write an ADT for rational numbers addition and multiplication. Addition of two   10

rational numbers a/b and c/d is $\dfrac{(ad + cb)}{ba}$ and multiplication of two rational numbers   10

a/b and c/d is ac/bd.

   (b) Write a program in Java to find n^{th} term of Fibbonacci sequence using recursion.   10

4. (a) Write a Non-Recursive function for inorder traversal.   10

   (b) Write a program in Java to create a singly linked list and perform the following   10
operations :

      (i) Insert into list   (iii) Delete from list

      (ii) Search for data   (iv) Display data.

5. (a) Explain Circular queue and Double ended queue with example.   10

   (b) Write a program in Java to impliment DFS traversal of a graph using adjacency matrix.   10

6. (a) Write a program to convert an expression from inflx to postfix. Use STACK ADT   10
array implimentation of the above program.

   (b) Write a program to construct binary tree for the following pre-order and in-order   10
traversal sequences.

        Pre-Order : A B D G C E H I F

        In-Order : D G B A H E I C F

7. Write short notes on any **four** of the following :-   20

    (a) Threaded binary tree

    (b) Huffman coding

    (c) Applications of stocks

    (d) Indexed sequential search

    (e) Array implimentation of linked list.

P4-RT-Exam.-Oct.-12-333

Con. 7376-12.   KR-3410

(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. 1 is compulsory.
      (2) **Solve** any **four** out of the remaining **six** questions.
      (3) Draw **neat** diagram wherever **necessary**.

1. (a) Using Quine Mc Cluskey method, determine the minimal SoP form for –   10
      $F(A, B, C, D) = \Sigma m(4, 5, 8, 9, 11, 12, 13, 15)$

  (b) Obtain the hamming code for 1010. Prove that hamming code is an error detecting and   10
      correcting code.

2. (a) Implement the following using 8 : 1 MUX   10
      $F(A, B, C, D) = \Sigma m(0, 1, 2, 4, 6, 7, 8, 10, 14, 15)$

  (b) Draw a 4 bit ring counter. Draw the timing diagram and explain the working of counter.   10

3. (a) Design a sequence generator using T flip flop for the given sequence. Also identify   10
      and check for lock-out condition (if any) –
      $0 \longrightarrow 2 \longrightarrow 4 \longrightarrow 5 \longrightarrow 0$

  (b) Using k-map method of minimization technique simplify   10
      $F(A, B, C, D) = \pi m(1, 2, 3, 8, 9, 10, 11, 14) + d(7,15)$

4. (a) Explain the operation of a 4 bit universal shift register.   10
  (b) Design a full adder circuit using half adders and some gates.   10

5. (a) Convert: SR to JK flip flop   10
              SR to D flip flop

  (b) Compare the different logic families with respect to the following parameters –   10
      Fan in, Fan out, Noise margin, speed and power dissipation.

6. (a) Convert $(243 \cdot 63)_8$ to decimal, binary $(210 \cdot 2)_4 + (312 \cdot 2)_4$ 10
  (b) Draw and design a combinational circuit that multiplies two 2-bit numbers A1 A2 and   10
      B1 B2 to produce a 4 bit product C3 C2 C1 C0.

7. Write short notes on :–   20
      (a) De Morgans Theorem .
      (b) Decade Counters
      (c) Race around condition in JK flip flop
      (d) PLA and PAL.

SE- SEM III (R.w.)comp. Isphere-Dec 2012
Discrete structure & Graph Theory

V-A4-II-Hf-Ex-12-D-12

Con. 7396-12.

KR-3533

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.

(2) Solve any **four** questions out of remaining **six** questions.

(3) Assumptions made should be **clearly** stated.

(4) **Figures** to the **right** indicate **full** marks.

1. (a) Show that :— 6

   $$1^2 + 3^2 + 5^2 + \ldots + (2n - 1)^2 = (4n^3 - n)/3.$$

   (b) Show that if any five numbers from 1 to 8 are choosen, then two of them will add to 9. 6

   (c) Out of 250 candidates who failed in an examination, it was revealed that 128 failed 8 in mathematics, 87 in physics and 134 in aggregate. 31 failed in mathematics and in Physics, 54 failed in the aggregate and in mathematics, 30 failed in the aggregate and in physics. Find how many candidates failed.

   (i) in all the three subjects.

   (ii) in mathematics but not in physics.

   (iii) in the aggregate but not in mathematics.

   (iv) in physics but not in aggregate or in mathematics.

2. (a) Determine whether the following relation are symmetric, asymmetric and antisymmetric. 6

   (i) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$
   (ii) $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

   (b) Construct truth table to determine whether the given statement is a tautology, 6 contradiction or neither :—

   (i) $(q \wedge p) \vee (q \wedge \sim p)$

   (ii) $(p \vee \sim q) \wedge p$

   (c) If R be a relation in the set of integers z defined by— 8

   $$R = \{(x, y) : x \in z, y \in z, x - y \text{ is divisible by 3}\}$$

   Show that the relation R is an equivalence relation and describe the equivalence classes.

[TURN OVER

3. (a) Define with example injective, surjective and bijective function.   6

   (b) Let A = { a, b, c, d, e } and Let R and S be two relations on A whose corresponding   8
   diagraph are shown below. Find $\overline{R}$, R^{-1}, $R \cap S$ and $R \cup S$.

R   S
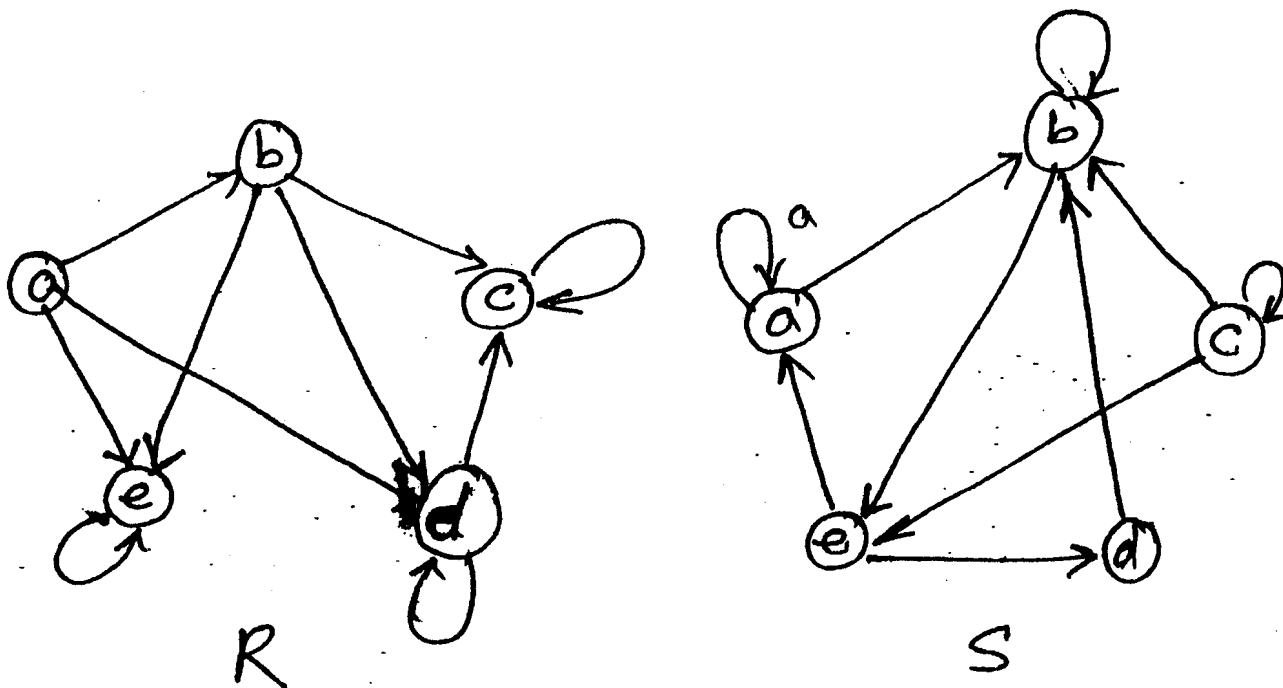
   (c) A connected planar graph has 10 vertices each of degree 3. Into how many regions   6
   does a representation of this planar graph split the plane ?

4. (a) Determine whether the following pair of graphs are isomorphic or not.   6
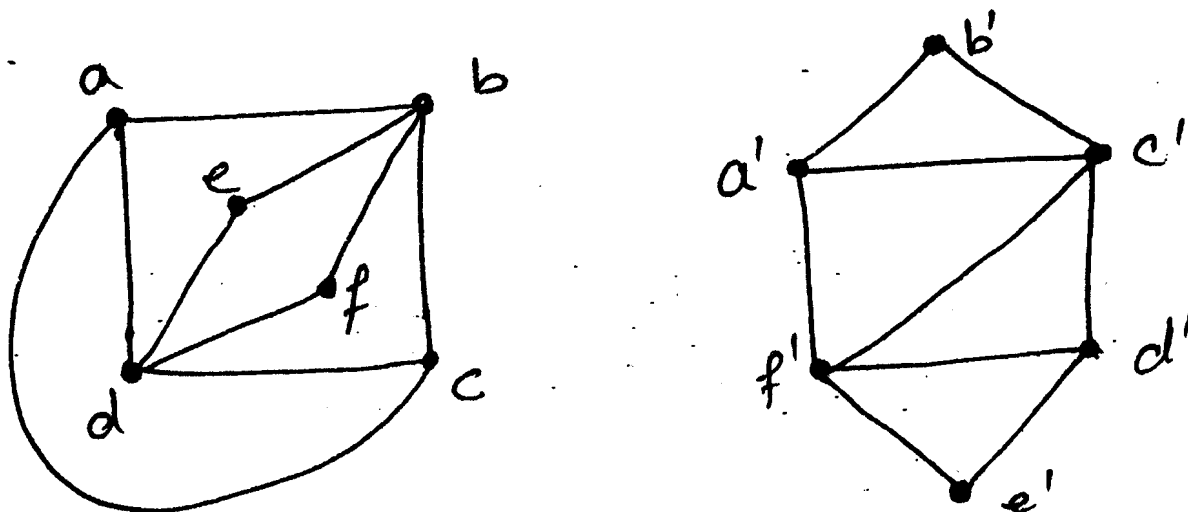
   (b) Let f : R → R, f(x) = $x^2 - 1$, g(x) = $4x^2 + 2$ find (i) f o (g o f) (ii) g o (f o g)   6

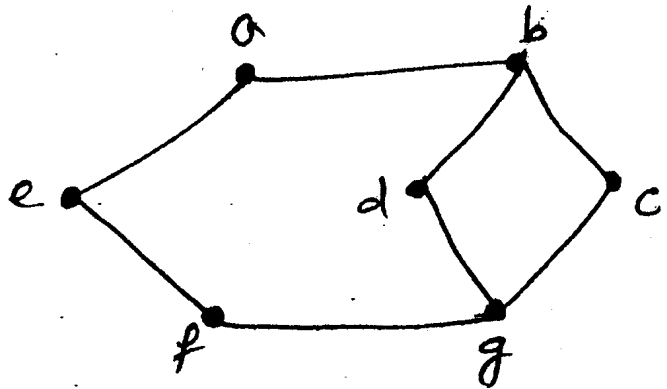   (c) Draw hasse diagram of the poset D60 and identify whether it is linearly ordered   8
   or not ?

5. (a) Let $A = \{ 1, 2, 3, 4 \}$ and $R = \{ (1, 2), (2, 1), (2, 2), (4, 3), (3, 1) \}$.   6
Find the transitive closure of relation R by Warshall's algorithm.

  (b) Define a ring and field. Let $R = \{ 0, 1, 2, 3 \}$. Show that the modulo 4 system is a ring.   8

  (c) Determine which of the following graph contain an Eulerian or Hamiltonian circuit.   6
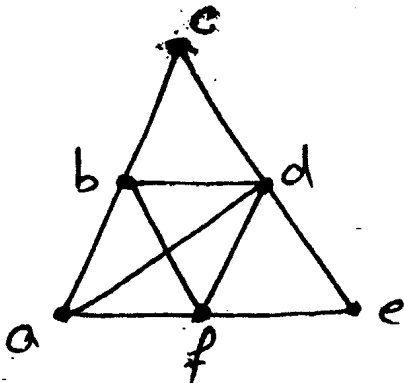
(i)   (ii)

6. (a) Consider the (2, 6) group encoding function $e : B2 \rightarrow B6$ defined by :—   8
     $e(00) = 0\ 0\ 0\ 0\ 0\ 0$
     $e(01) = 0\ 1\ 1\ 1\ 1\ 0$
     $e(10) = 1\ 0\ 1\ 1\ 0\ 1$
     $e(11) = 1\ 1\ 0\ 0\ 1\ 1$

     Decode the following relative to maximum likelihood decoding function—
       (i) $0\ 0\ 1\ 1\ 1\ 0$ (ii) $1\ 1\ 1\ 1\ 0\ 1$ (iii) $1\ 1\ 0\ 0\ 1\ 0$

  (b) Solve the recurrence relation $a_n = 4\ (a_{n-1} - a_{n-2})$ where $a_0 = 1$, $a_1 = 1$.   6

  (c) Show that $\{ 1, 5, 7, 11 \}$ is a abelian group under multiplication modulo 12.   6

7. (a) Define with example :—   8
     (i) Normal subgroup.
     (ii) Spanning tree.
     (iii) Planar graph.
     (iv) Quantifiers.

  (b) Consider chains of divisors of 4 and 9 i.e. $L_1 = \{ 1, 2, 4 \}$ and $L_2 = \{ 1, 3, 9 \}$ and   6
partial ordering relation of division on L_1 and L_2. Draw the lattice $L_1 \times L_2$.

  (c) Prove that every field is an integral domain.   6

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(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
     (2) Attempt any **four** questions out of remaining **six** questions.
     (3) Draw **neat labelled** diagram wherever **necessary**.
     (4) Answer to **each** new question to be started on **fresh page**.

1. (a) Explain Van-neumann Architecture.   6
   (b) Compare Computer Organization and Computer Architecture with example.   4
   (c) Explain different Mapping techniques of Cache Memory.   10

2. (a) Compare and contrast DMA, programmed I/O and Interrupt driven I/O.   10
   (b) Compare SRAM and DRAM.   5
   (c) Compare RISC and CISC.   5

3. (a) Explain design of control unit with respect to Softwired and Hardwired approach.   10
   (b) Explain IEEE-754 standard formats to represent floating point numbers.   10

4. (a) What is cache coherency ? Explain different protocols to solve cache coherency.   10
   (b) Explain Non-Restoring division algorithm for performing 19/4.   10

5. (a) Explain multiplication of signed numbers $-13 * -5$ using Booth's algorithm.   10
   (b) What is virtual memory ? Explain Role of paging and segmentation in virtual memory.   10

6. (a) Explain SPARC processor in detail.   10
   (b) What is the difference between pipelining and parallelism ? Show that k-stage pipelined processor has k-times speed up as compared to non-pipelined system.   10

7. Write short notes on following (any **four**) :—   20
   (a) Wave front Array
   (b) RAID Memory
   (c) Static and dynamic dataflow computer
   (d) Systolic processor
   (e) I/O processor and I/O channels
   (f) Characteristics of two level memory.

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